

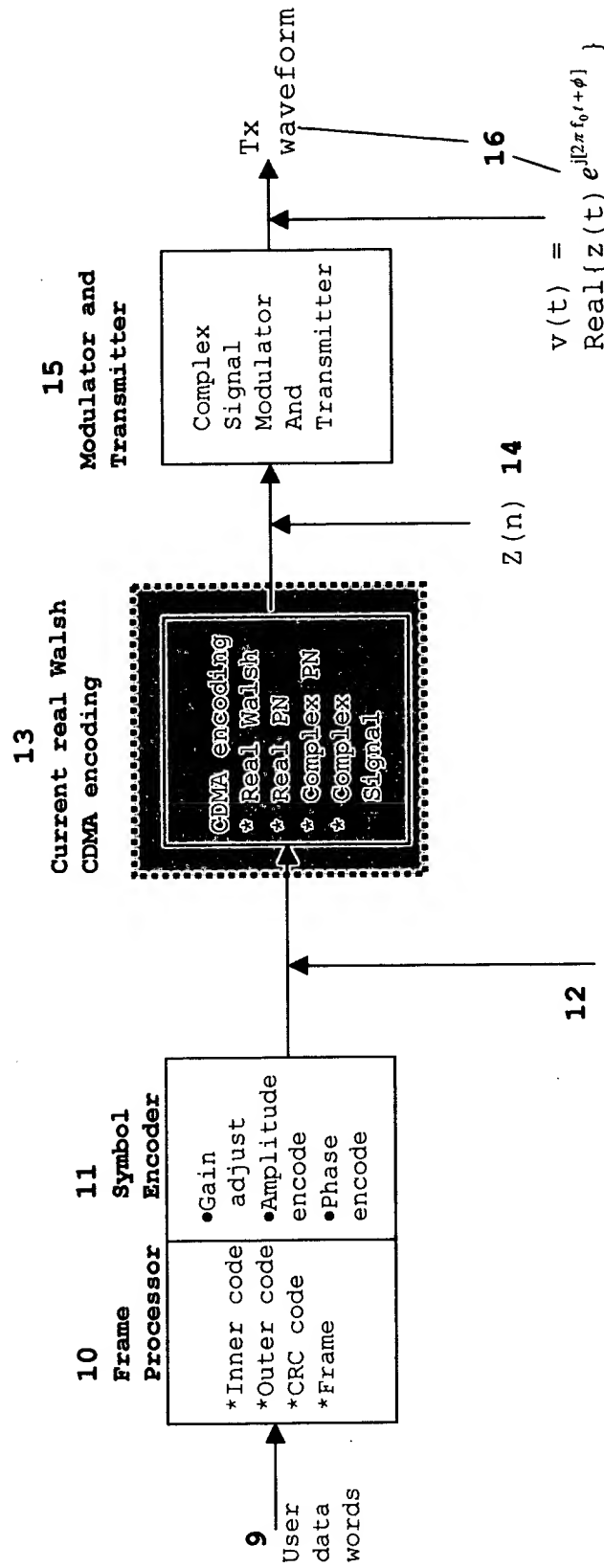
APPLICATION NO. 09/826,117

INVENTION: Hybrid ~~Complex~~ Walsh Codes for CDMA

INVENTOR: Urbain A. von der Embse

DRAWINGS AND PERFORMANCE DATA

FIG. 1 CDMA Transmitter: Block Diagram



User data symbols
 $= \{Z(u)\} = R(u_R) + jI(u_I)$
 For complex data symbols $u = u_R = u_I$
 For real data symbols $u = \text{index for}$
 counting the user pairs (u_R, u_I)



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FIG. 1 CDMA Transmitter: Cellular Application

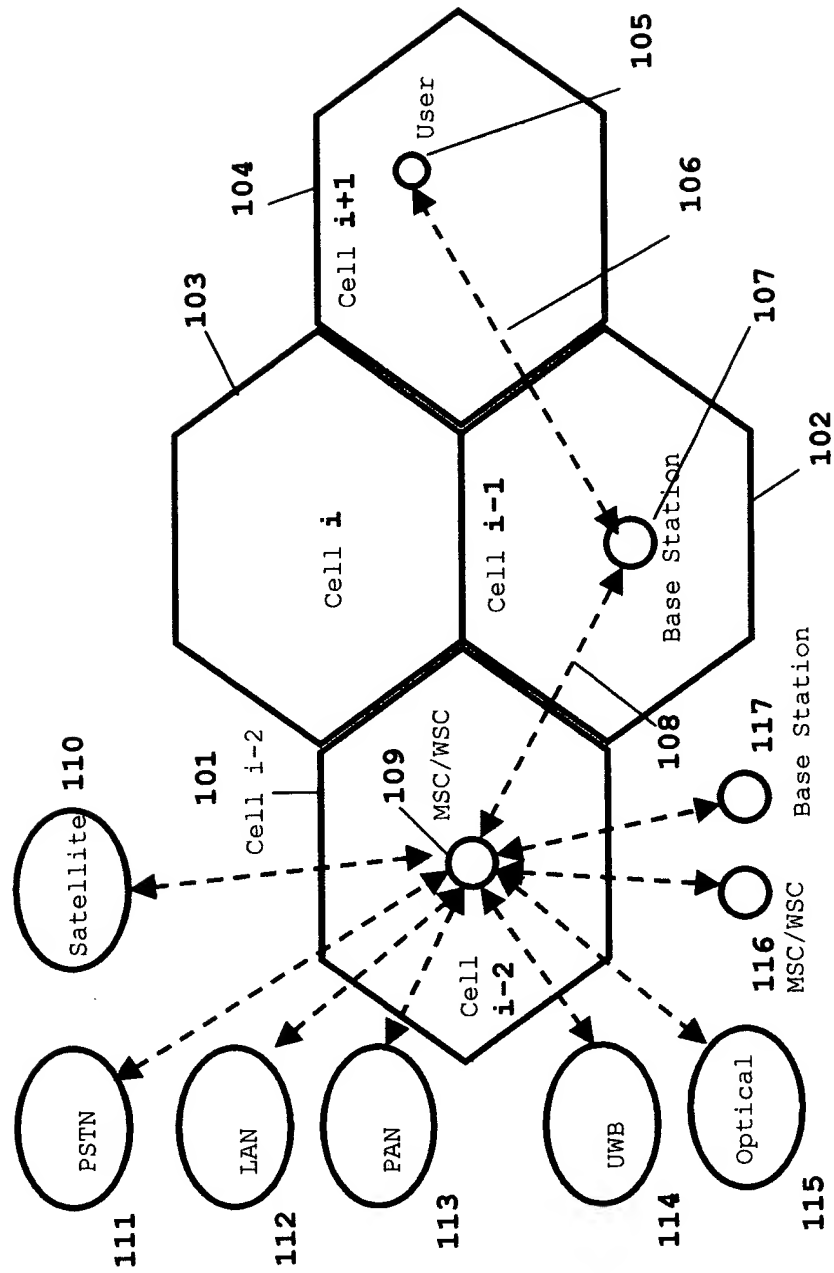


FIG. 2 Real Walsh CDMA Encoding

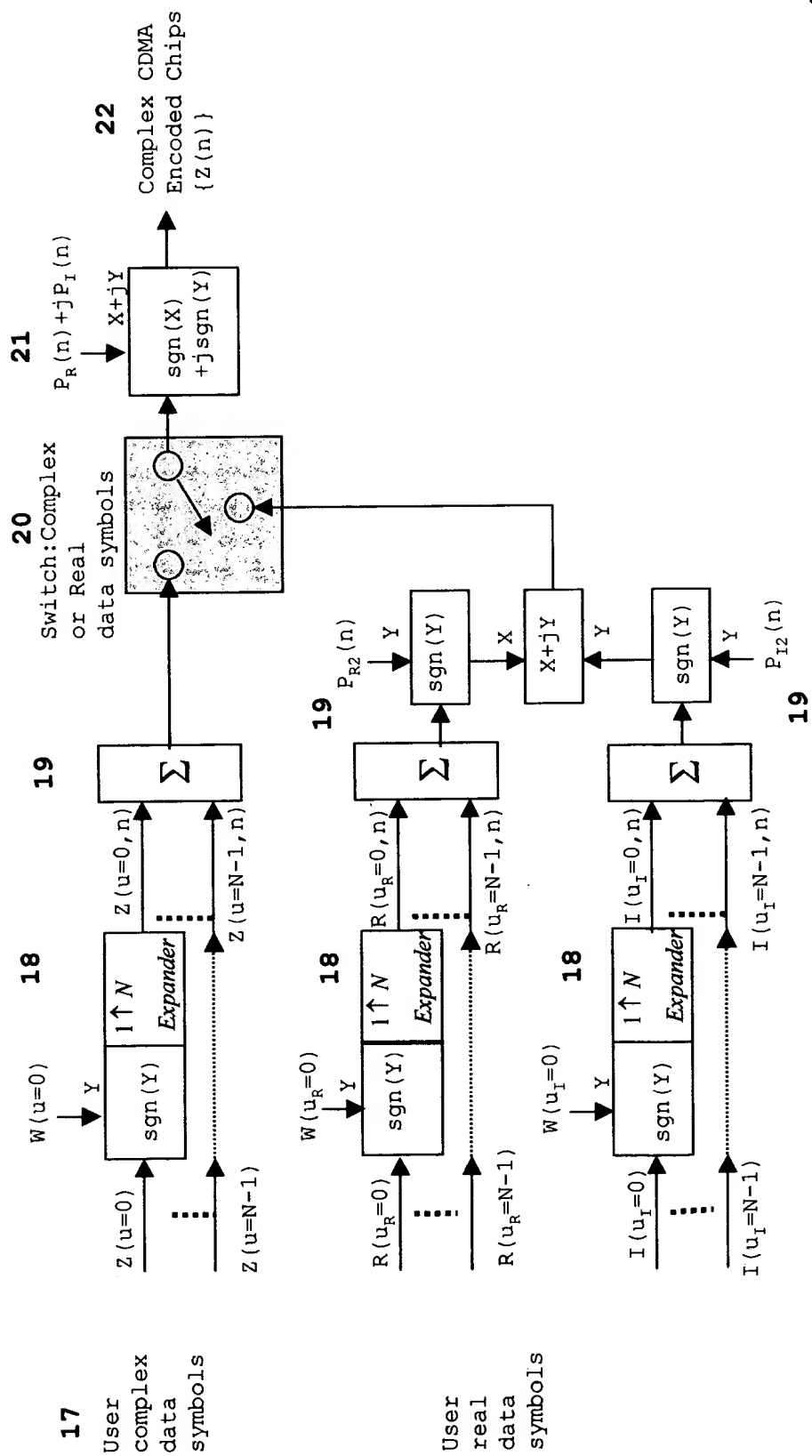


FIG. 2 CDMA Transmit Signal Processing

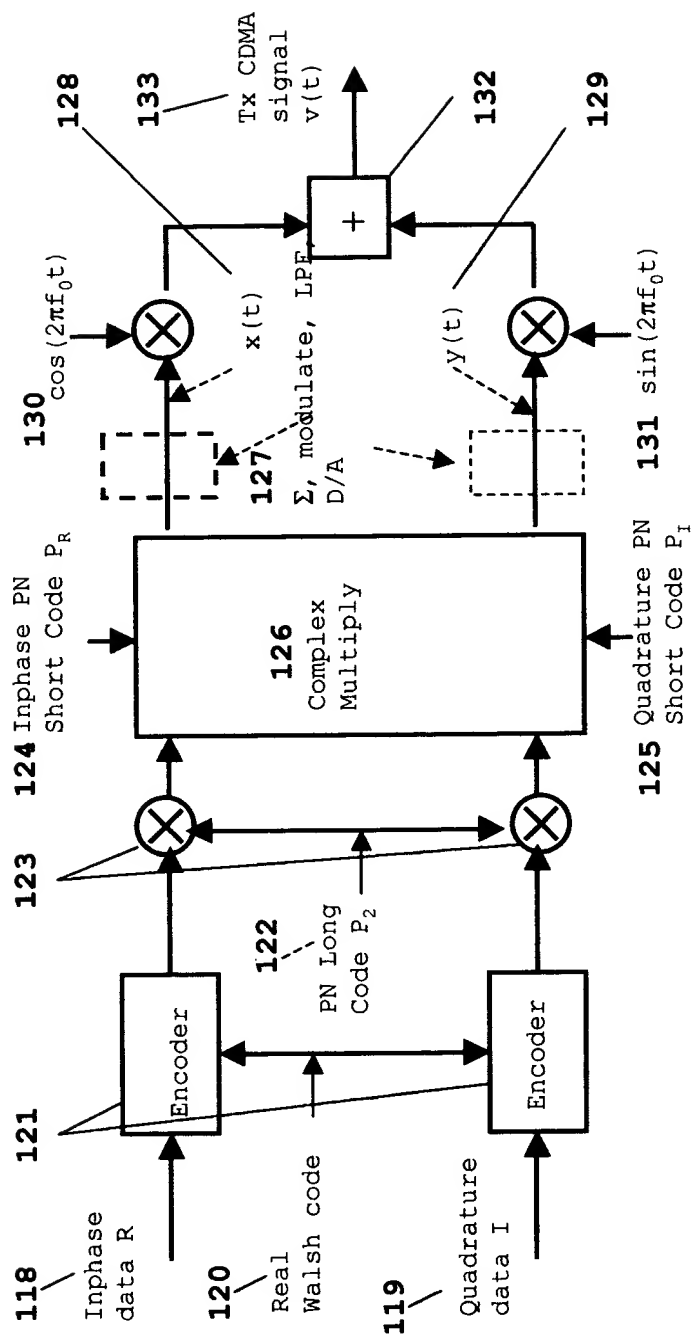


FIG. 3 CDMA Receiver Block Diagram

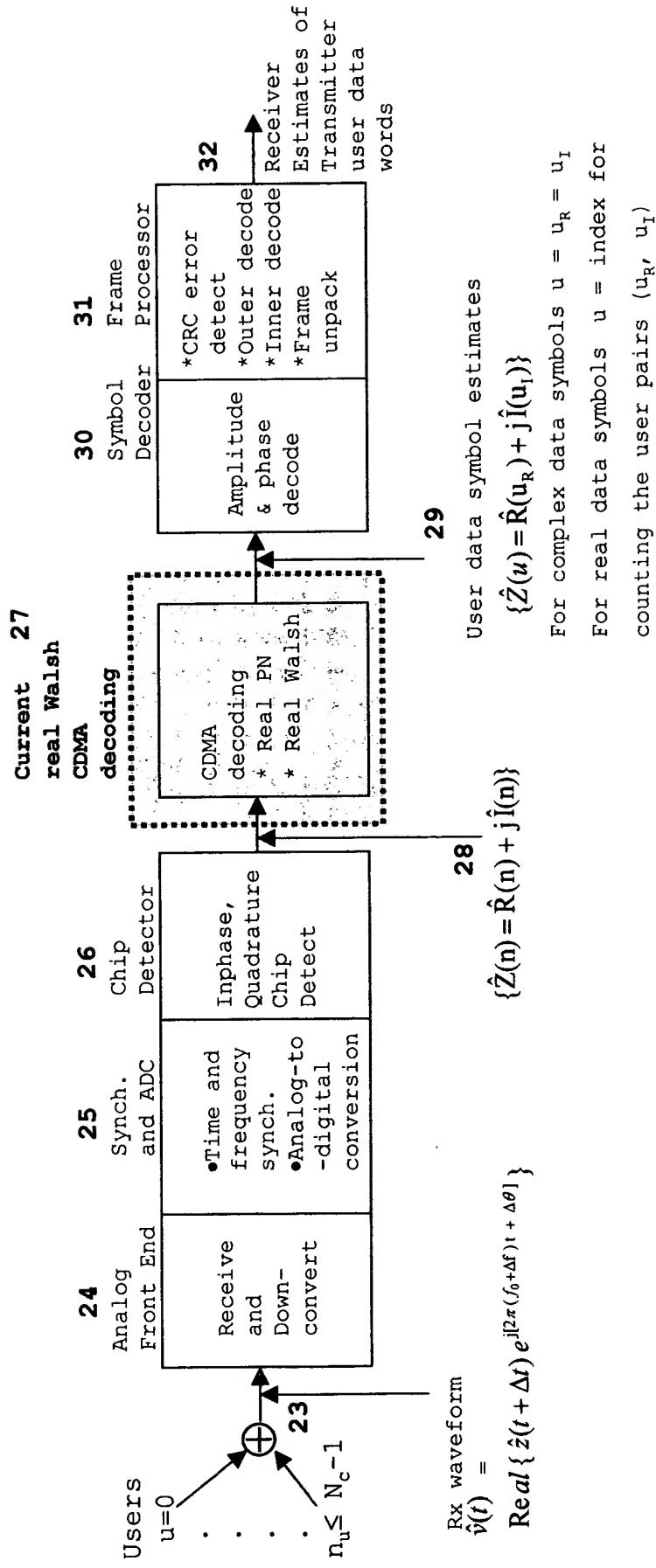


FIG. 3 CDMA Receive Signal Processing

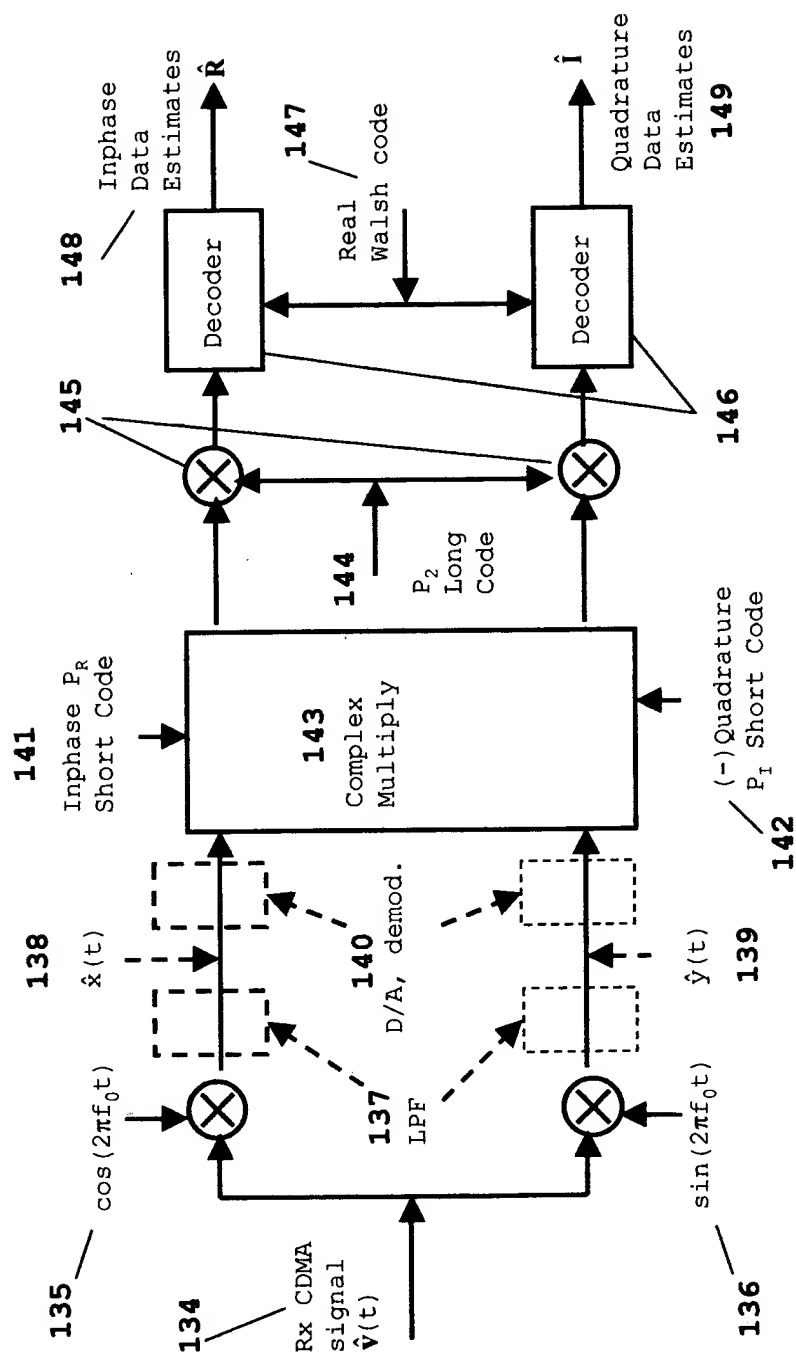
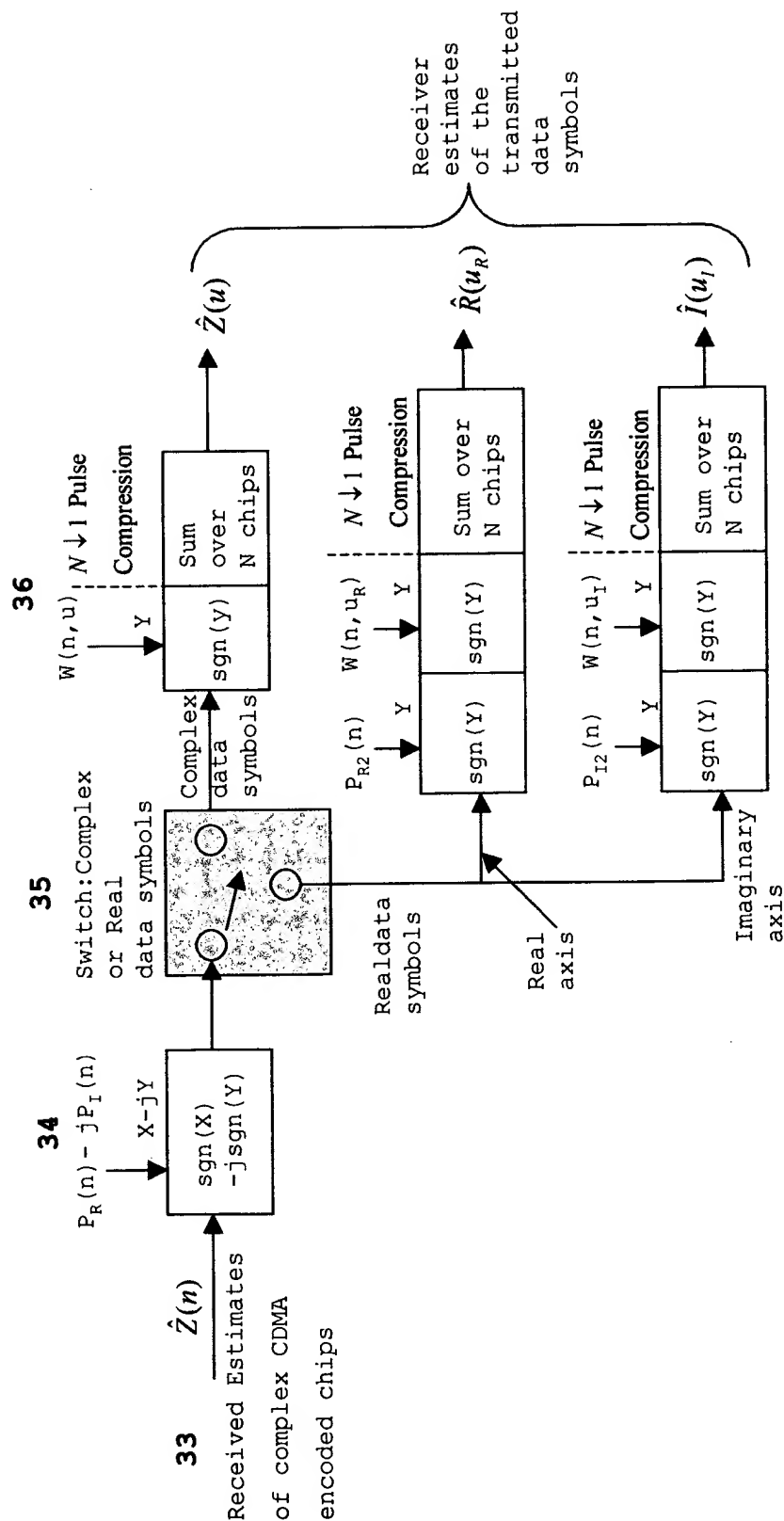
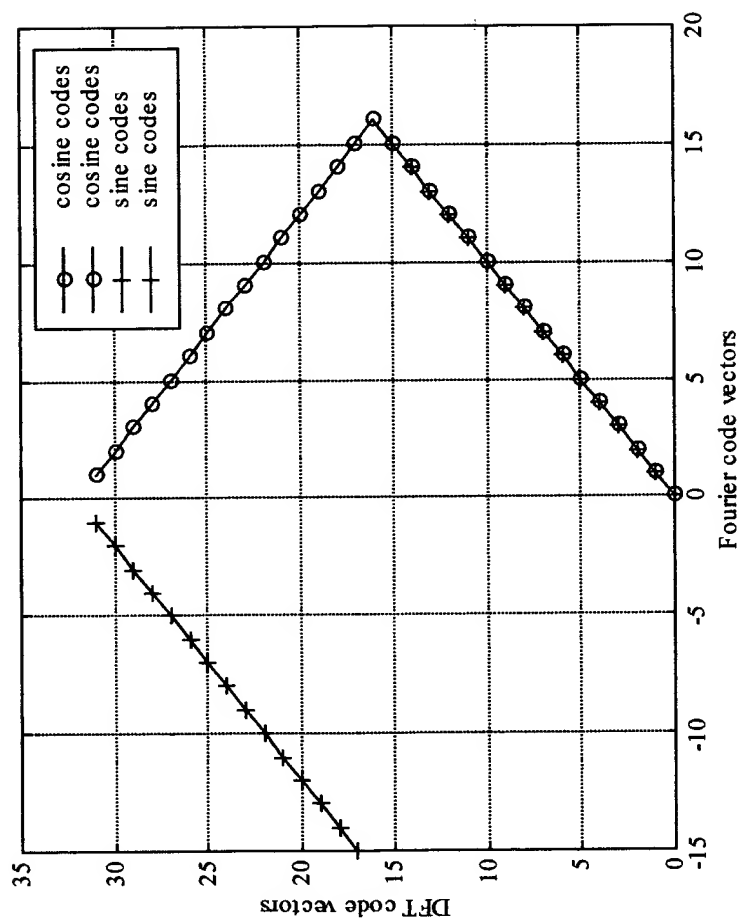


FIG. 4 Real Walsh CDMA Decoding



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**FIG. 5 Correlation of Fourier Codes
with DFT Codes for N=32**



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FIG. 5A Hybrid Walsh Implementation Algorithm

168	Sequence index	Hybrid Walsh reordering permutation of the real Walsh code vectors	
167	$u=0, 1, \dots, N-1$	Hybrid Walsh inphase (real) code vector $W_R(u)$	Hybrid Walsh quadrature (imaginary) code vector $W_I(u)$
	$u = 0$	$W_R(u) = W(0)$	$W_I(u) = W(0)$
	$u = 1 \text{ to } (N/2-1)$	$W_R(u) = W(2i)$	$W_I(u) = W(2u-1)$
	$u = N/2$	$W_R(u) = W(N-1)$	$W_I(u) = W(N-1)$
	$u = N/2+\Delta u$ for $\Delta u=1 \text{ to } N/2-1$	$W_R(u) = W(N-1-2\Delta u)$	$W_I(u) = W(N-2\Delta u)$

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FIG. 5B Hybrid Walsh Implementation Algorithm

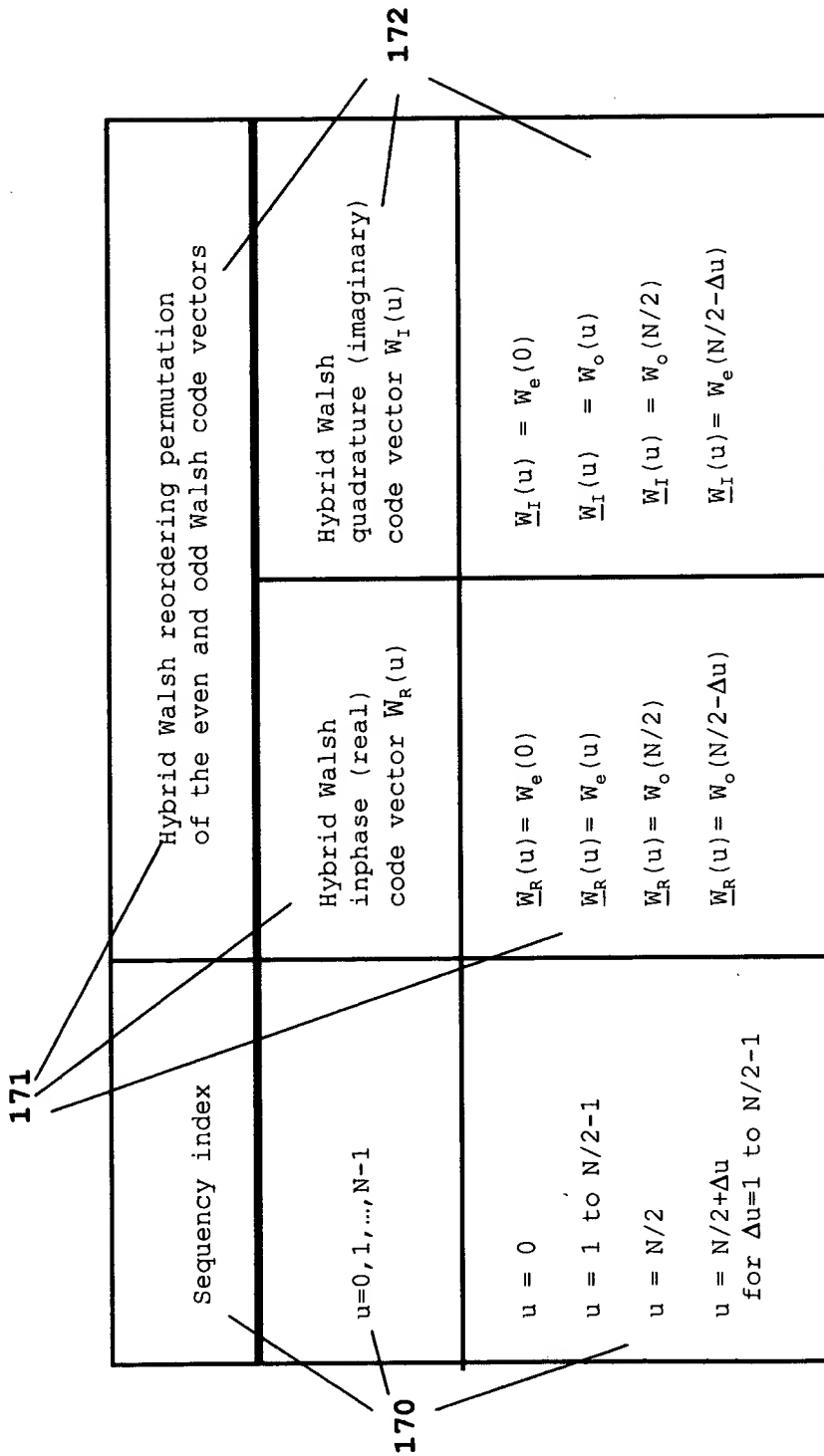
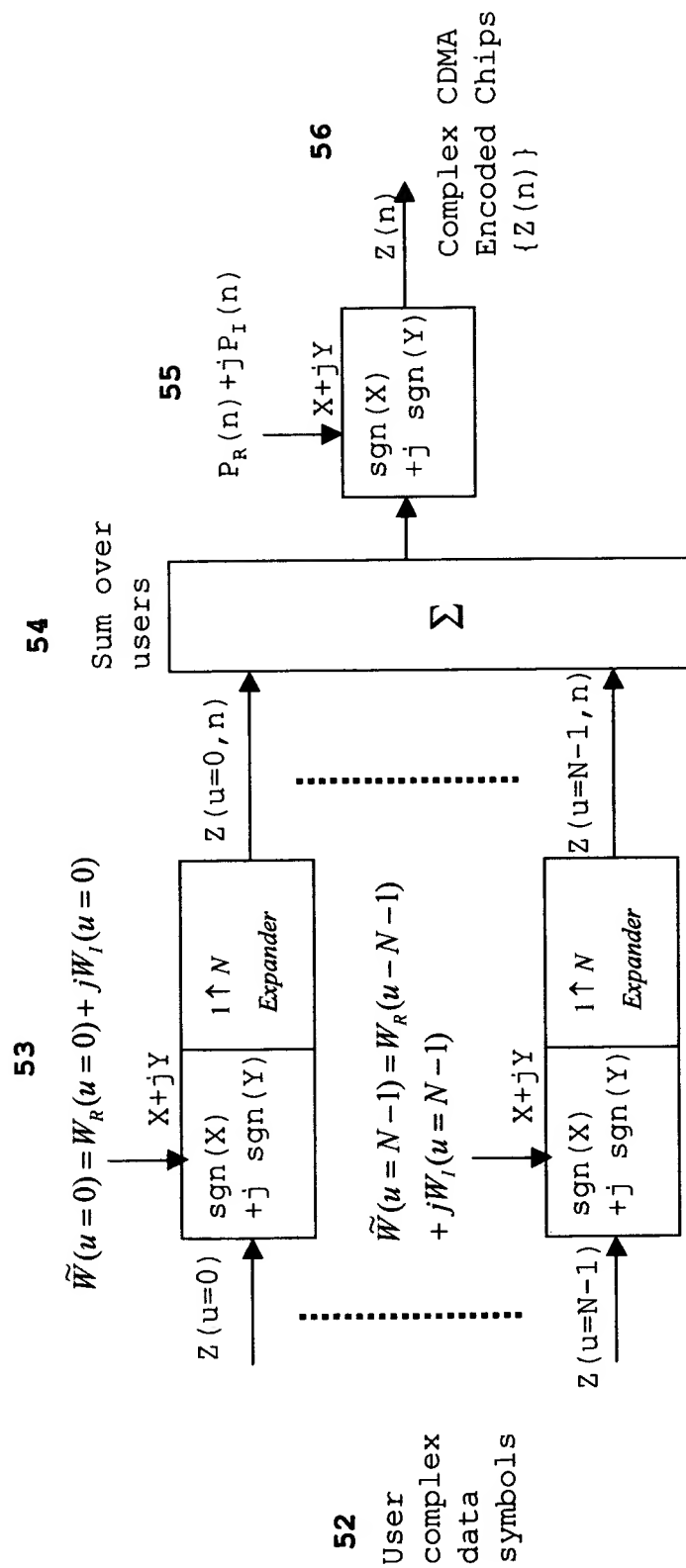


FIG. 6 Complex Walsh CDMA Encoding



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FIG. 6 Hybrid Walsh Transmit Signal Processing

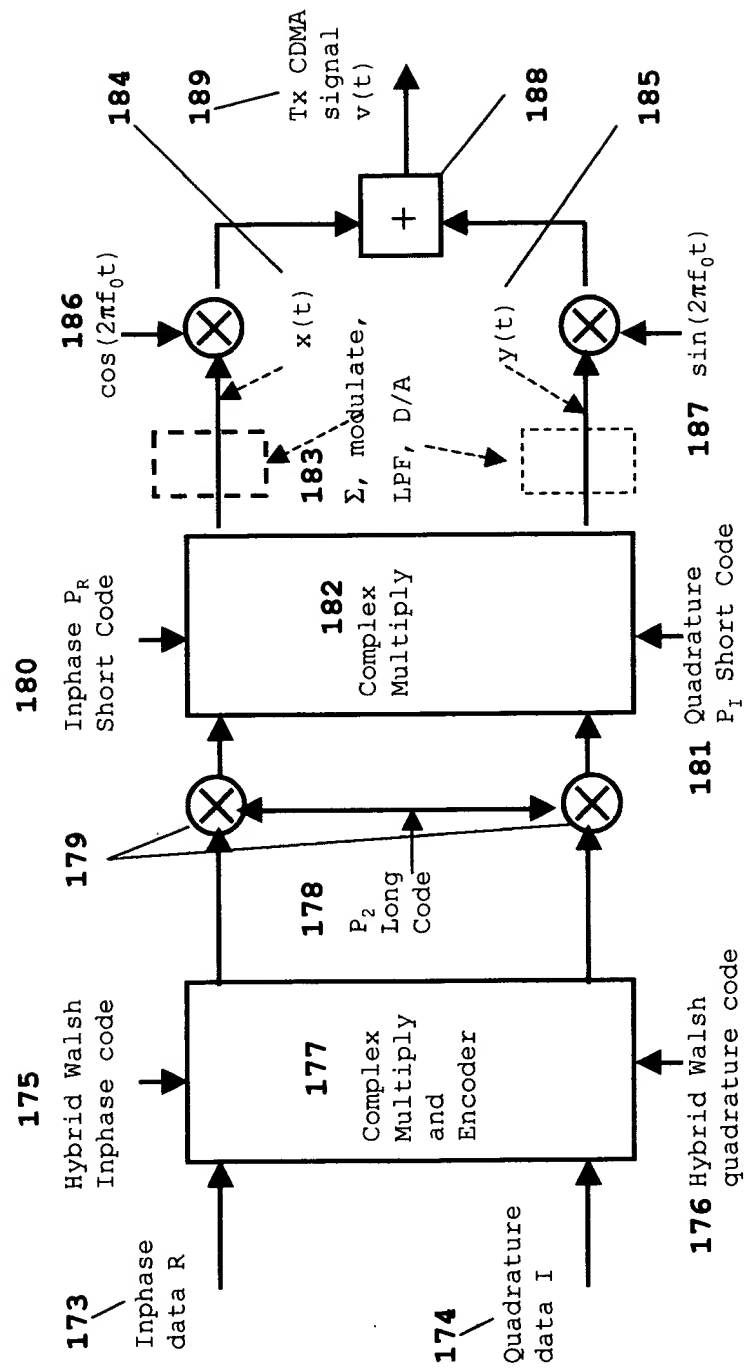


FIG. 7 Complex Walsh CDMA Decoding

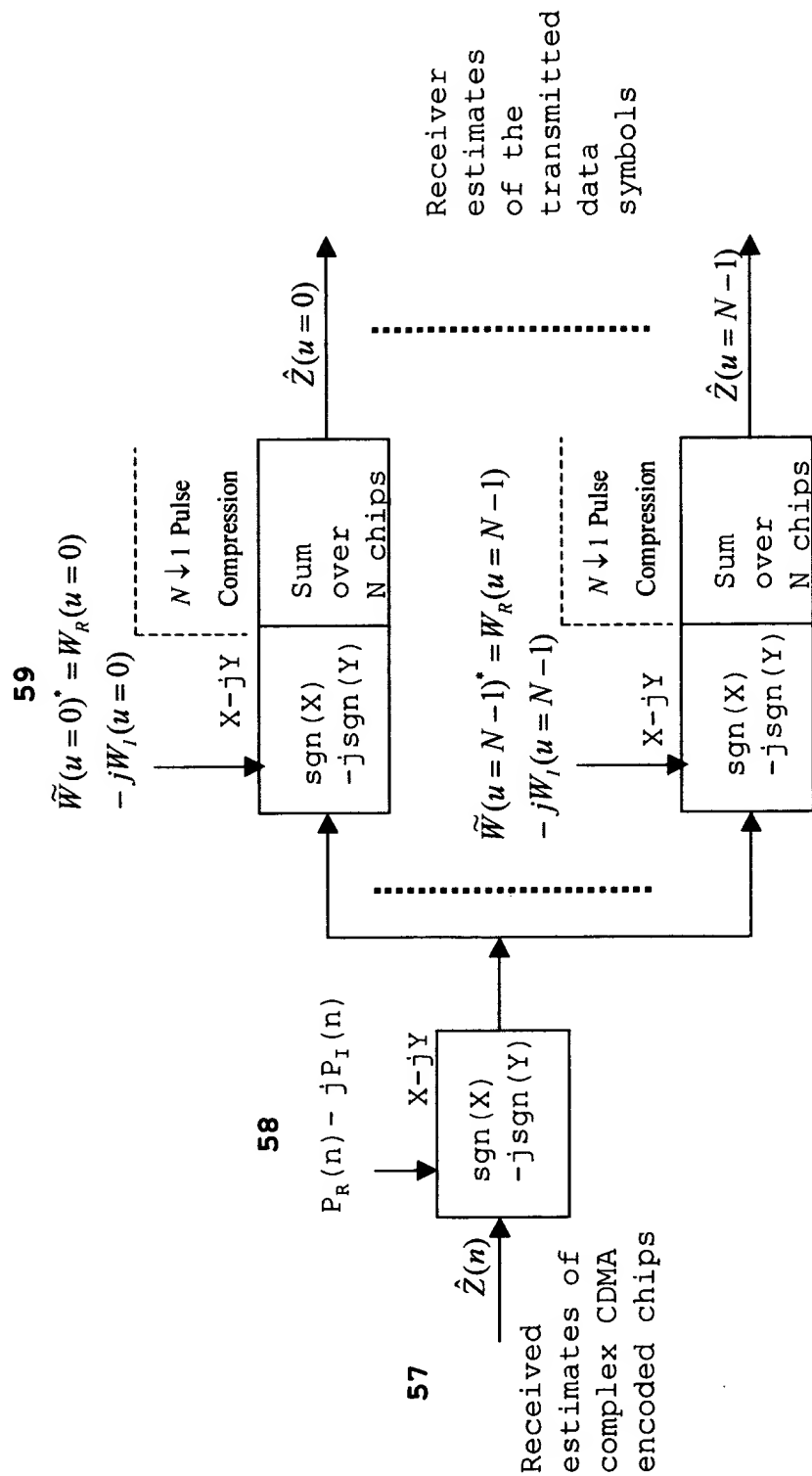


FIG. 7 Hybrid Walsh Receive Signal Processing

